

Graphical Literacy Development using Learning Management System

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Abstract

In the given article the example of learning management system is presented. The learning management system was used for study of compulsory subject of Descriptive Geometry and Engineering Graphics for students of extramural department of the Riga Technical University (RTU). In addition the Blackboard Learning System (BB) was used for accommodation of a teaching material. The general structure of materials placed in environment of the BB system includes: theoretical material, performance of training exercises, and performance of the tests. Results of the research presented in this paper give possibility to make conclusions on efficiency of use of the above-mentioned systems in mastering of a subject of Descriptive Geometry and Engineering Graphics. The article is a continuation of the research [Veide and Strozheva 2007], presented at Vth Conference Geometry and graphics, and covers the period from September 2006 till June 2007.

Keywords: engineering graphics, e-learning, Blackboard Learning System

1 Introduction

The use of modern information technologies in training (network distance training; network distance courseware; virtual universities; etc.) opens new opportunities for development of the system of education [Boyle et al. 2005]. However, the effective introduction of information technologies in training is connected to adaptation of the participants of educational process to information technologies. In addition opportunities of computer engineering and program systems must be adapted to the purposes, tasks and at last to participants of educational process. Recently, a variety of schemes of distance learning has arisen. These schemes use electronic ways of linking between the learner and the source of instruction with increased interaction between them.

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Distance learning (DL) is a strategy developed to harness the power of learning, information, and communication technologies to modernize education and training [Manning 2000]. The DL initiative is intended to implement the "anytime-anywhere" learning concept to provide access to the highest quality education and training that can be tailored to individual needs and delivered cost-effectively, whenever and wherever it is required.

The DL is structured learning process without the physical presence of the instructor. The DL is enhanced with the technology. It may draw upon resources which are physically distant from the location where learning is taking place [Jonsson 2005].

Now standards of learning technology use the learning management systems which include new functionalities and capabilities such as back-end connections to other information systems, complex tracking and reporting, centralized registration, on-line collaboration and adaptive content delivery. The Blackboard Learning System was used for improvement of quality of educational process in the Riga Technical University.

The BB environment delivers a course management system, customizable institution-wide portals, online communities, and an advanced architecture that allows for Web-based integration with administrative systems. The BB system is a kind of software applications specially designed to enhance teaching and learning. Intuitive and easy-to-use for instructors, the Blackboard Learning System is built on a scalable enterprise technology foundation that facilitates growth and performance. Institutions around the world use the Blackboard Learning System to:

- Create powerful learning content using a variety of Web-based tools;
- Develop custom learning paths for individual students or groups;
- Facilitate student participation, communication, and collaboration;
- Evaluate students' work using a rich set of assessment capabilities;
- Bring top publisher content into e-Learning.

Only a browser is necessary for students who are using the BB system. Most students in Latvia have personal computers with fast internet connectivity. Those who do not have computers can access them in libraries or in computer classroom of the RTU. Hence instructors may assume that everybody is able to practice using the e-materials offered. Students can access systems like the BB system using their hand-held devices, e.g. the new Nokia E61 cellular telephone [Caprotti et al. 2002]. This mobile phone has a

full keyboard and the conventional browser software that runs on it and this gadget can be connected to the internet. Browsing such hand-held devices, which can be expected to be very common in the near future, will also make real the use of automatically graded quizzes and examinations in any class room.

2 Course in BB environment

The duration of a bachelor program at Civil engineering Department in the RTU is 7 semesters and each of them consists of 16 weeks and additional 4 weeks of exam session. The compulsory subject of Descriptive Geometry and Engineering Graphics is limited to 3 ECPS and students must learn it in the first semester. In this course the students have to complete all the individual home assignments and final exam.

The learning material of the course of Descriptive Geometry and Engineering Graphics has been placed in the BB environment as an experimental prototype to help students in their mastering of topics of the learning subject. The given subject traditionally is difficult for study and mastering, in particular for students of extramural department. The use of the BB system was not obligatory for the students. In addition the students have had possibilities to use the BB environment with an additional opportunity to study theoretical material, as well to get consultations with an instructor and perform their exercises in order to master the learning subject of Descriptive Geometry and Engineering Graphics.

The material of the course of Descriptive Geometry and Engineering Graphics in the BB environment includes [Stanchev 2001]:

- A brief description of the course and a table of contents;
- Announcements and important information for participants;
- Instructor's e-mail address, numbers of telephone and fax, and regular mailing address including office hours;
- The themes of theoretical material of the course including goals and objectives;
- A list of all exercises, assignments and other tasks of the course;
- Explicit information on how students will be graded on assignments, tests, participation; each assignment should be linked to relevant course documents;
- A list of supplementary books, and other learning resources;
- A possibility of interactions with the instructor by means of e-mail communication;
- An opportunity of discussions between participants of educational process.

The students become more competent in formulation of their questions when they use e-mail for dialogue with the instructor. Hence, to ask the question, the student must understand the topic. Necessity to ask questions and to discuss them induces the students for preliminary independent work with a material of the learning subject.

Participants of the BB system carry out exercises and tests placed in the BB environment before a final exam. Exercises, which are placed after corresponding themes of the course, are offered to be performed by the students for their becoming more self-prepared

for the tests. Using the BB system the students perform their exercises without limitation of the time and it gives them possibilities to repeat their attempts to solve the tasks. In result the information on the earned points and the right answers are accessible to the students. Thus, the students can independently estimate their level of self-readiness for performance of the tests. The tests in the BB environment are limited with the time and there is only one opportunity for the students to perform the tests correctly. Only final points are accessible to the students. During the distance course of education, the BB system assesses the students formally. It indicates a level of mastering of the course by the students and the standard attained. The formal assessment is intended to verify how well students are able to meet the session objectives on the one hand, and a depth of knowledge learned, on the other hand.

3 Feedback from students

The students, who perform their exercises and tests placed in the BB environment, develop their skills in solving the tasks of the subject learned and accordingly pass their final exam more successfully than those students, who did not use the system of BB (Fig. 1). The results of final exams show that the most of students, who learned the subject in the BB environment, got 7-8 points. The students, who not learn it in the BB system, got 5-6 points.

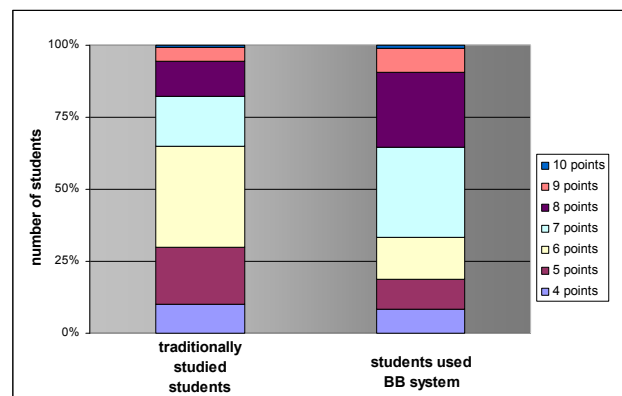


Figure 1: Results of final exams of the course of Descriptive Geometry and Engineering Graphics.

Comparison of results of the final exams of the students, who learned the subject in the BB environment, and those, who did not learn it in the BB system, gives the opportunity to make conclusions on an efficiency of programs similar to the BB programs, which are used for improvement of quality of training [Moreno et al. 2006]. It also is interesting to note that a frequency of visits of consultations, which arise in educational process, has become decreased, but in spite of that the quantity of the questions remained the same the questions itself have become more concrete.

The students demonstrated the best results under the tests placed in the BB environment in following themes: Fundamental views - Point, Orthographic projection and Drawing procedure. Less successful results of the tests were got by the students on such themes as Line, Plane, Sections and Intersections. These results of the tests give possibility to make a conclusion that lectures and

graphic works, which the students must carry out independently, are necessary for mastering of the themes of the descriptive geometry, connected with methods of construction.

The use of the BB system is a free choice of the students. So it makes an opportunity to observe a degree of interest of the students to use this method of training, to reveal main problem of topics learned and to master necessary skills. The term of registration for persons interested to use the BB system has been limited with one month. Thus, a group of participants, which consists of 73 people, has been generated during the limited time of registration.

The students chose intensity of studying of the learning materials independently. Dependence of the intensity of the work in the BB environment during the semester is shown on Fig. 2. The students have shown their greatest activity immediately after registration in the BB system. It makes an opportunity to display the difference between a level of students' interest to a new method of training in a period of time immediately after registration in the BB system and, traditionally, the same their interest at the end of the term of the training. Frequency of use by students of areas of the main content in the learning course of Descriptive Geometry and Engineering Graphics in the BB environment is shown on Fig. 3. The results of final exams show that higher estimates were received by the students who used the BB system more actively.

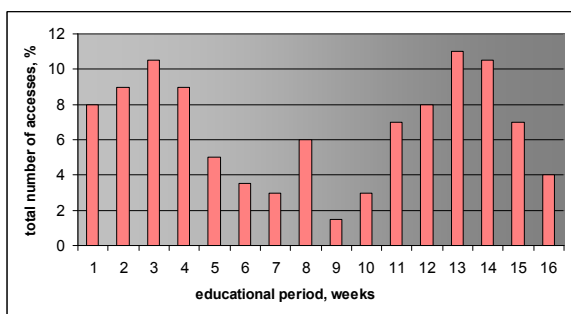


Figure 2: Correlation between activity of the students in the BB environment and duration of educational period

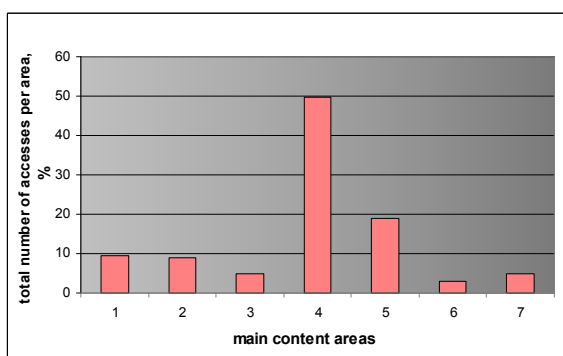


Figure 3: Overall summary of usage by students the areas of the main content in the BB course of Descriptive Geometry and Engineering Graphics. 1 – announcements and important information for participants; 2 – the brief description of the course; 3 – the staff information; 4 – the themes of theoretical material of the learning course including goals and objectives; 5 –

tests; 6 – a list of supplementary books, and other learning resources; 7 – communication area.

An anonymous evaluation was carried out at the Riga Technical University in the end of the learning course of Descriptive Geometry and Engineering Graphics. The students' answers to a question "Why results of the BB tests are insufficiently good?" are shown on Fig. 4. This question was addressed to the students who have received an average estimation below 6 as result of the tests. Training exercises have been placed in the BB environment for improvement of preparation of the students to the tests.

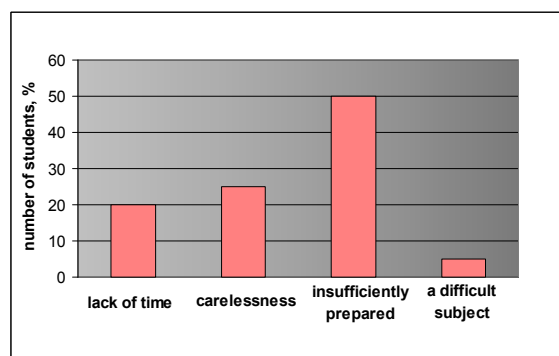


Figure 4: Students' answers to a question "Why results of the BB tests are insufficiently good?"

All the students whose responses are in this survey told that they would recommend the learning course to their fellow students. Since the assessment was conducted anonymously, the responses reflect students' perceptions of the learning course. The students' feedback was very positive, and it is clear that the learning course of Descriptive Geometry and Engineering Graphics in the BB environment will emerge as a real option at the university level.

4 Conclusions

Our experiences in using the BB system in actual teaching process have confirmed the potential of the BB environment as a beneficial and useful system for teaching. The system enables the user to produce electronic materials for the learning course simply as a by-product of teaching.

The results of the final tests of the learning course of Descriptive Geometry and Engineering Graphics, which are presented in this article, demonstrate that higher average estimate (7,4 points) were received by the students who used the BB system. The students, who not learn it in the BB system, got average estimate 6,2 points. To explain this fact it is possible to suppose that the students, who use the BB system, have an opportunity to carry out more exercises and tests in the learning course. Therefore, the quality of the training course, that is necessary for development of graphic literacy of engineers, improves.

The main challenges in educational system are how to keep students focused in the subject matter, how to motivate them to work independently, and how to fight the high rate of the students' dropping out. These challenges are accentuated in the on-line setting in which the direct contacts between the students

and the instructor are limited. It is easier for the students not to focus when the instructor does not see them. And it is easier for them to drop out because, in the on-line setting, they interact with a computer and not with a person [Caprotti et al. 2002].

Like the development of good textbooks, the development of good educational software is a long-term process of trial and error that will need continuously to draw on the experience of the best tutors, those who are responding to the needs of individual learners. Since education is the main pillar of our society's future, all efforts in that direction are well spent.

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